



# DEPARTMENT INQUIRY OF LION-TAILED MACAQUE, *MACACA SILENUS* IN CAPTIVE DOMAIN AND IN BREEDING ENCLOSURE

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## ABSTRACT

The behavior of any species is the key factor for analyzing various patterns of lifestyle and the environment in which they survive. The behavior of the species can generally be recorded by understanding its facial expression, vocal communication, body gestures which also depend on the immediate vicinity of the animal where it dwells. Various behavioral patterns such as animal tool behavior were recorded where the macaque tried to use the tool for drinking water from its very own enclosure. Grooming behavior was predominantly observed among mother to juvenile, female macaque to male macaque and within female to female. Imprinting habit was noticed where the juveniles followed adult members of the group. Instinct behavior was eminent where the juveniles were attached to the female parent. Parental care was remarked where the mother (*Macaca silenus*) carried the offspring most of the time with her and had keen observation when the young one climbed the tree. Playful behavior was recorded among juveniles. Sexual behavior was heeded where the dominant male tries to mate with the female member of the group (13,14). The investigation of our study shows that the *Macaca silenus* exhibit distinct variations and fluctuations in the behavioral patterns with the elevated rate of dominance in the group. Our data provide the first evidence for the imprinting behavior of *Macaca silenus* in captivity.

Keywords: *Macaca silenus*, Lion-Tailed Macaque, Imprinting Instinct.

## Introduction

*Macaca silenus* is 40 to 60 cm in length, with the tail adding an additional 24 to 38 cm. Males weigh typically between 5 to 10 kg, but females weigh only 3 to 6 kg. The body is covered with black fur. The tail is long thin and naked with a tuft of black puffy hair at the tip. Both the males and females have a greyish lion-like mane of fur that surrounds the face. The face itself is bare and black (1,15)

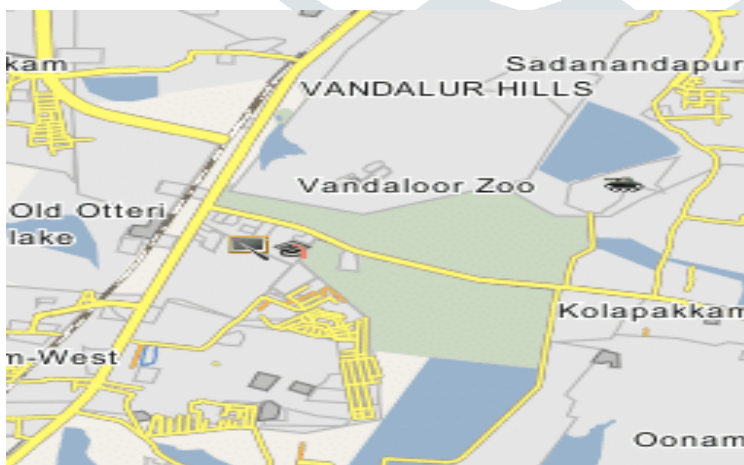
This species is polygynous. Groups of *Macaca silenus* typically contain one male, several females and juveniles. In *Macaca silenus* females mature at 5 years of age and males mature at 8 years of age. *Macaca silenus* have no specific breeding season. When a female is in estrous, swelling occurs in the area under her tail (perineal estrus swelling) and she emits a courtship call to let males know she is ready to copulate (10,12).

*Macaca silenus* has a maximum lifespan of 38 years in captivity, although it is more typical for them to reach about 30 years of age (11). In the wild, the expected life span is about 20 years (2, 12). *Macaca silenus* are the only macaques in which males use calls to advertise their territorial boundaries (3,9). Male macaques are territorial and generally give off a loud call to let entering troops know they are in area (1,12). Macaques have extensive pattern of communication typical of diurnal primates (5,7). They rely heavily on vocal communication (10). *Macaca silenus* have seventeen different vocal patterns (15) and many types of body movements to express communication (1,6). In addition, visual communication through body postures, facial expression, and tactile communication in the form of grooming, play, mounting and aggression occur in macaques (8,12).

## Materials and methods

### 1.1 Animals and study site

The study was carried out from the month of August 2018 to June 2019 for a period of ten months on *Macaca silenus* in Arignar Anna Zoological Park (AAZP) located at Vandalur, Chennai 600048 (12.87917N, 80.086167E). The group consisted of two males, two females and four juveniles. The research was carried out on the captive *Macaca silenus*. The survey was analyzed with due permission of zoo authorities, principal chief conservator of forests, Panagal maligai, Saidapet, Chennai, Tamilnadu. The study emphasized on the behavioral deportment of *Macaca silenus* in on display and in the breeding enclosure.



Map 1. Geographical representation of Arignar Anna Zoological Park, AAZAP, Vandalur, Chennai-600048.

## Behavioral observations

Behavioral data were probed by a continuous sampling technique where all the behavioral activities were inscribed through field notes. Behavioral data were documented by observing facial expression, animal tool behavior, Instinct behavior, Playful behavior, grooming behavior, body gestures, imprinting habit, Sexual behavior and vocal sounds, man-made stimuli and natural stimuli (mean observation time per day: 7 hours). Behavioral scrutiny of Male macaques, Female macaques and Juveniles were transcribed.

## Data analysis of Behavioral deportment of *Macaca silenus* in breeding enclosure.

The behavioural analysis was evaluated on daily bases for various behavioural changes of the animal. The statistical analysis was carried out using Spearman rank correlation. The x value represents the number of behaviours and the Y value represents the number of times the particular behaviour was repeated. We also analyzed the data using Mann-Whitney U Test to observe the behavioural pattern in the animal display area and in the breeding enclosure.

## Results

Behavioral studies confer a preferable perception to understand the animal better and to furnish a healthier environment for the species' well-being. The behavior of the species that were recorded in the animal display areas and in the breeding enclosure was as follows:

**Table 1. Behavioral Deportment of *Macaca silenus* in Animal Display Area: (Table -1)**

S.No	ANIMAL BEHAVIOR	X VALUE (No. of behaviors)	Y VALUE (No. of repetition)		
			Male	Female	Juvenile
1	Animal tool behavior	1	2	5	7
2	Grooming behavior	2	0	35	0
3	Imprinting behavior	3	0	0	10
4	Instinct behavior				
4a	Parental care	4a	0	45	0
4b	Playful behavior	4b	0	10	75
4c	Resting behavior	4c	30	20	20
5	Sexual behavior	5	15	15	0
6	Dominance	6	2	2	0
7	Hunting behavior	7	2	2	2
Spearman correlation value of Y- axis			0.49653	-0.24268,	-0.13056
Mann- Whitney U- test value of Y- AXIS			U=58.50	U=28.50	U=46.00

The female macaque of the troop runs to animal house and gets a plastic bottle, she then climbs on tree branches and closely observes the bottle and drops it after which the other macaque takes the bottle and drinks water from its enclosure by filling the water in it and after drinking the other macaque also drops the bottle. The convention of tools is commonly seen in both primates and non-human primates. The animal tool behavior was predominantly seen in Juveniles (7) compared to males (2) and females (5).

## Grooming behavior:

Grooming behavior was perceived among the troop most often where the mother grooms the juvenile and the dominant male is also groomed by female macaques of the group. The grooming behavior was observed among mother to juveniles, female to male macaques, female to female macaque. The grooming behavior was

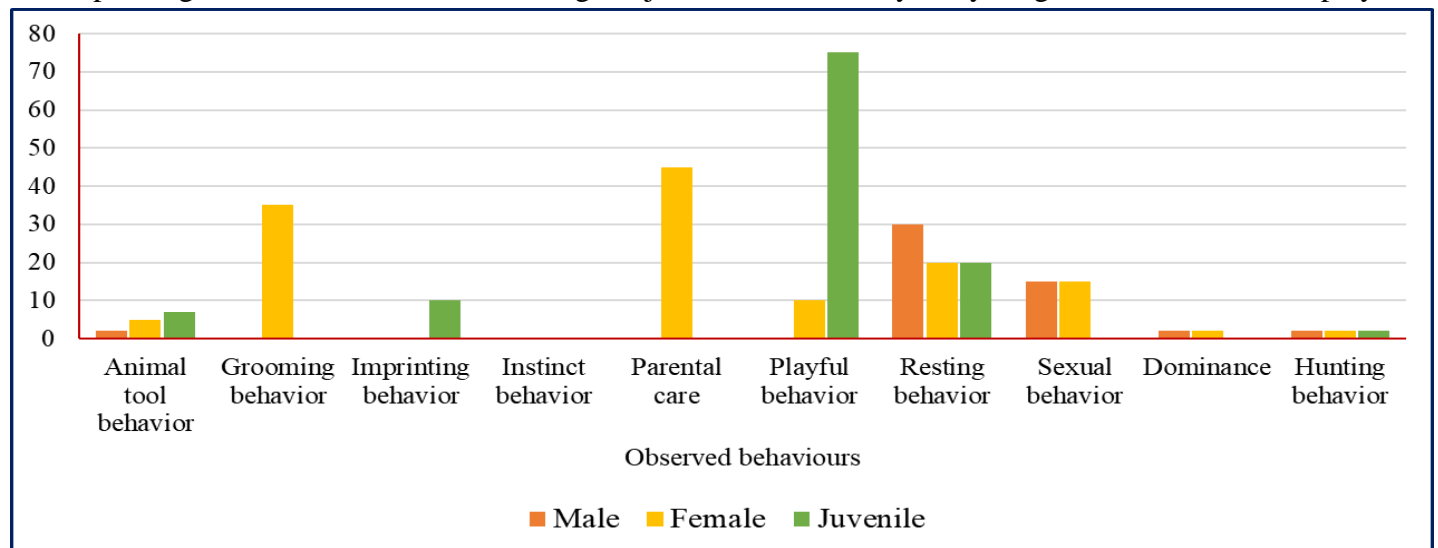
not observed between male-to-male macaque. Grooming behavior was most prevalently seen in females (35) but is not seen in the case of male and juveniles. This type of behavior serves a hygienic purpose to the species. Grooming removes dirt, insects, parasites, dead skin, and tangled fur.

**Figure.1. Behavioral deportment of *Macaca silenus* in Animal display area.**

#### **Animal tool behavior:**

#### **Imprinting behavior:**

Imprinting behavior was observed among the juveniles where they carry twigs from the animal display area



to animal houses and take the twig out from the house after some time throw the twig into the water just as the adult macaque of the troop used to do. The juveniles even imitated the adult macaques like eating small leaves or eating the small insects like ants the juveniles hackneyed the adult macaques. Imprinting behavior was commonly observed among Juveniles (10) whereas it was not seen in males and females.

#### **Instinct behavior:**

Instinct behavior was recorded where the juveniles were attached to their mothers. This is a type of natural instinct that is born with the species. There are certain behavioral patterns that really coexist with instinct behavior such as parental care, fight or flight instinct.

#### **Parental care:**

Parental care was observed among the female members of the group where the female macaques take care of their young ones. The female macaques groomed their young ones. They carried their young ones attached to their bellies when they came out from animal houses to animal display area. The female macaques had always kept eyes on juveniles when they climb on trees or when they walk in enclosure and they even have a close observation even during playful behavior. Parental care was highly seen in female macaques (45) whereas it was not observed in males and juveniles.

**Playful behavior:**

Playful behavior was mostly seen in juveniles. The juveniles climb on tree faster and come down and run into animal houses. The juveniles pull each other from tree branches. They climb on tree branches and jump down. They even swing on ropes which is in their enclosure. They get on their forelimb and bump at each other's back. Playful behavior can also be observed in adult macaques but mostly their main focus is survival so as the primates grow, they just are more adapted to survival skills and protection of their troops and young ones. The playful behavior was habitually observed in juveniles (75), in females (10) and is not observed in males.

**Resting behavior:**

Resting behavior was largely observed when there was raise in temperature. This type of behavior was observed from afternoon 12 pm till 3.30. The macaques used to rest on treetops, they sit under tree branches where there was a rise in temperatures during summer. The macaques generally used to come out drink water and return back to the animal houses where they are found to be resting. Resting behavior was chiefly seen in males (30), in females, and in juveniles the resting behavior repetition was found to be (20).

**Sexual behavior:**

The dominant male macaque mated several times with the female macaque of the group. The mating was marked by estrous swelling on the perineal region which was noticed by the male macaque. Sexual behavior recurrence was similar (15) in the case of male and female macaques of the troop and was not exhibited in juveniles.

**Dominance:**

Dominance was seen twice during the feeding time where one of the female macaques tries to snatch the food from the other macaque during feeding time. The macaque generally takes off the watermelon from the other macaque runs at a certain distance and eats it. It was even observed during sexual behavior. The dominance was equally recorded in both male (2) and female (2) but was not recorded in juveniles.

**Hunting behavior:**

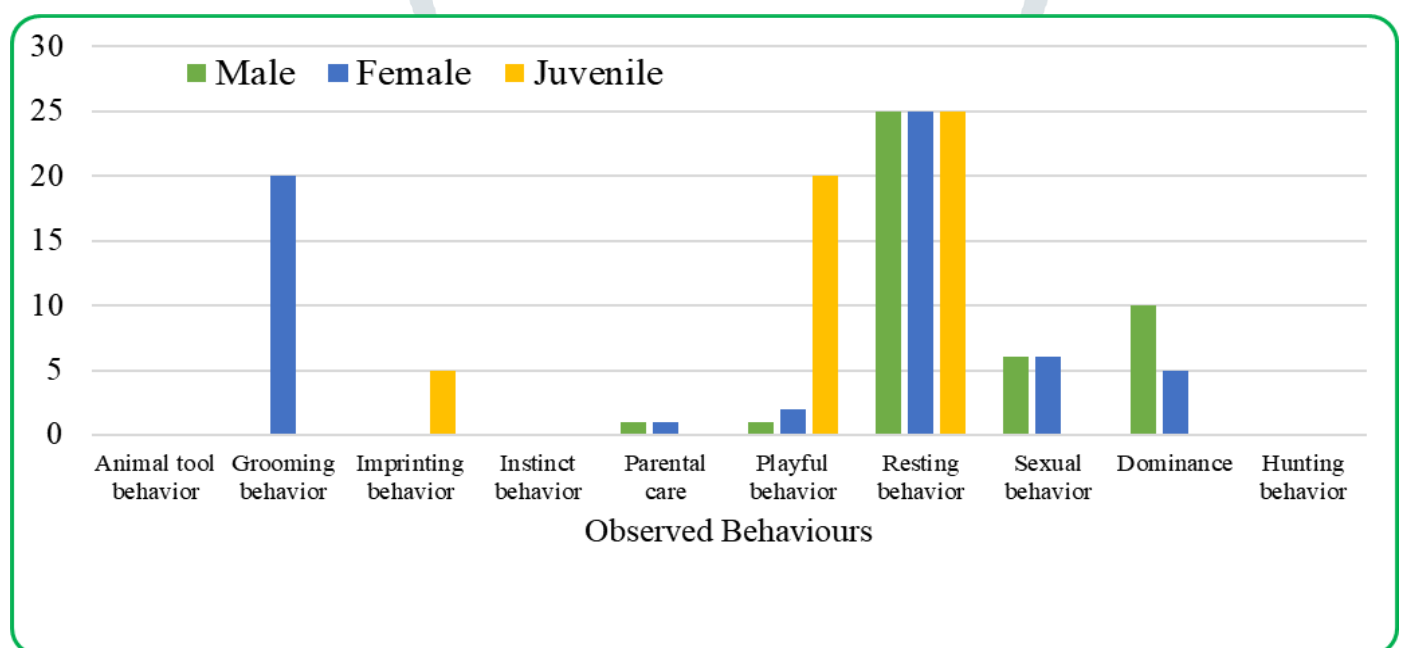
Hunting behavior was observed post afternoon where one of the macaque chases the squirrel at a very fast pace and the other macaques also try to hunt the squirrel in groups. This might be one of the skills that were passed from non-human primates to human primates where they hunt in groups, the behavior was equally recorded in males (2), females (2), and juveniles (2).

The behavior that was recorded was tested using Spearman rank of correlation and Mann-Whitney U test. In accordance with it, found the values of Y-Axis significant with the Mann-Whitney U test where the behavior and the number of times were repeated were substantial. The overall Y value of Mann-Whitney U test for male was found to be 58.50 and for female was analyzed to be 28.50 whereas for juveniles it was 46.00. We also employed spearman correlation for the above said behavioral pattern the values for male was 0.49653, for female - 0.24268 and for juveniles-0.13056.



**Table 2. Behavioral deportment of *Macaca silenus* in breeding enclosure**

Sl. No	Animal Behavior	X value (No. of behaviors)	Y value (No. of repetition)		
			Male	Female	Juvenile
1	Animal tool behavior	1	0	0	0
2	Grooming behavior	2	0	20	0
3	Imprinting behavior	3	0	0	5
4	Instinct behavior				
4a	Parental care	4a	1	1	0
4b	Playful behavior	4b	1	2	20
4c	Resting behavior	4c	25	25	25
5	Sexual behavior	5	6	6	0
6	Dominance	6	10	5	0
7	Hunting behavior	7	0	0	0
Spearman correlation value of Y- Axis			0.50714	0.15256	-0.0297
Mann- Whitney U- test value of Y- axis			U=56.50	U=51..50	U=58.00

**Figure .2. Behavioral deportment of *Macaca silenus* in the breeding enclosure.****Animal tool Behavior:**

Animal tool behavior was not observed in breeding enclosure among male, females and juveniles in the course of the present study.

**Grooming behavior:**

Grooming behavior was usually seen in females (20) where the female macaques of the troop groom male and juvenile no grooming were observed among male macaques and juveniles.

**Imprinting behavior:**

Imprinting behavior was most repeatedly seen in juveniles (5). The juveniles engraved the adult macaques while looking out for small invertebrates such as ants for their feed. This type of behavior was not observed in males and females.

**Instinct behavior:**

The juveniles were very much attached to their mothers. This particular behavior helps the species for its survival.

**Parental care:**

Parental care was observed mutually in both male and female macaques (1) where they had an eye on their young ones while they climb on treetop. This particular conduct was not observed in juveniles.

**Playful behavior:**

Playful behavior was seen regularly in juveniles (20) where they chase the other macaque and climb on trees faster and get down and it was similarly seen in both male and female macaques (1) where they run coming down to the animal house and run back to tree branches.

**Resting behavior:**

Resting behavior was observed alike in males females and juveniles (25) where they rest under the shade of tree branches or on top of the tree branches. Resting behavior was observed when there was rise in temperature during midafternoon time.

**Sexual behavior:**

Sexual behavior was prominent among dominant male macaque and Female macaques (6) of the troop. Sexual behavior was not displayed in juveniles.

**Dominance:**

Dominance was pragmatically observed in both male (10) and female (5) macaques of the troop during sexual behavior. The adult macaque runs and come near the water pipe wherein he drinks water and covers the water pipe with its limb while the other macaque tries to drink the water. No dominance was seen in juveniles.

**Hunting behavior:**

Hunting behavior was not observed among male, female macaques and, juveniles in the breeding enclosure during the study period.

The behavior that was recorded was tested using Spearman rank of correlation and Mann-Whitney U test. In accordance to it, we found the values of Y-Axis significant with the Mann-Whitney U test where the behavior and the number of times were repeated were substantial. The overall Y value of Mann-Whitney U test for male was found to be 56.50 and for female was analyzed to be 51.50 whereas for juveniles it was 58.00. We also employed spearman correlation for the above said behavioral pattern the values for male was 0.50714, for female 0.15256 and for juveniles -0.0297.

## Discussion

Animal behaviour plays a very important role in getting a better insight into the species. *Macaca silenus* are diurnal animals and hence most of their activities are observed from dusk to dawn. These macaques are endangered species, hence conserving them is very important as they play an important ecosystem role in seed dispersal. The main importance of this study is to get better insight into the endangered species and highlights its conservation.

Our results show that the *Macaca silenus* exhibited customary behavioral patterns. The chief behavioral pattern that was observed is grooming behaviour which plays an important role in social bonding.

Animal tool behaviour was observed in the animal enclosure area wherein they use tool for drinking water from their enclosure. Tool behaviour is the type of behaviour which was passed from non-human primates to human primates. Grooming behaviour is mostly seen in the female members of the group, wherein they groom the male and juveniles of the group. In accordance to the behavioural observations the males didn't groom the female or the juvenile of the troop because of the dominance and the hierarchical position of the species of the group.

Imprinting behaviour can also be called as learned behaviour where the juveniles learn survival skills from their mother most dominantly. These behaviours can also be acquired where one individual copy the behaviour from other member of troop such as usage of tool for food for its survival. Instinct behaviour is observed where the juveniles are attached to their mother from the time of their birth. Playful behaviour, hunting behaviour, parental care, resting behaviour and sexual behaviour also comes under instinct behaviour. These are the behaviour that the species are born with.

Parental care was perceived where the female macaques carried their young ones and had an eye on them during playful activity. Parental care plays an important role in learning survival skills, protection of juveniles from the predators. Separation of juveniles from their mother might affect the young one's mental ability for survival. Playful behavior is dominantly seen in the juveniles where they cling on tree branches, run in their area, which is also seen in human primates. Playful behaviour is not much seen in adult macaques as their prime focus is survival.

Resting behaviour is most commonly observed behaviour. The macaques mainly rest on tree branches where there is a raise in temperature. These macaques might rest during high-temperature times to save their energy to carry out various other activities of their daily commotion. Sexual behaviour is seen where the dominant male mates with the female member of the troop.



Dominance was observed during feeding time. Generally, the dominant macaques not just dominate during maintenance and protection but also during feeding time where they snatch the food from less dominant species. Hunting behaviour was observed where the macaques tried to chase the squirrel.

No aggression was observed during the study as there was no intrusion of troop in their area. There was no sign of threat to species such as predators, and no entry of any other male of the species in their area.

The statistical value for the afore experimental study was analysed by Mann-Whitney U Test which shows significance among X and Y values.

**Conclusion:** It is extensively acknowledged that habitat modifications affect wildlife of all taxa. Altered habitats tend to species renaissance and this makes it all the more important to investigate the persistence of such species behaviours. The insights obtained from this study provide a crucial first step in considerate the potential spectacle of behavioural pattern in *Macaca Silenus* and certainly this kind of scientific observations will pave the way for the conservation and management of such species populations.

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## REFERENCES

1. Burton F. The multimedia Guide to the Non-human Primates. Ontario: Prentice Hall Canada.
2. BBC,2005."Lion-tailed macaque, wanderoo". Accessed May 31 2005. <http://www.BBC.Co.UK/nature/Wildfacts/factfiles/220.shtml>.
3. Bridget M.Waller, Jamie Whitehouse and Jerome Micheletta, Macaques can predict social outcomes from facial expressions. *Animal cognition*, 19, 5, (1031), (2016).
4. Gautam.P. Prajapati, "Animal Behavior" cyber tech publications, first published 2017, ISBN: 978-93-5053-592-9.
5. Lawrence, J.M. & Cords,M. (2012) Old World Monkeys. *Nature Education Knowledge* 3(7):17.
6. Jeremy N. Marchant Forde, Paul.D, Mc Greevy, David B. Morton, Christine J. Nicol, Clive J.C.Philips, Peter Sandoe and Ronald R. Swaisgood, CAB international 2010. ISBN: 13:9780851997247.
7. Joy Mech, ILAR Journal, volume 39, Issue 1,1 January 1998.
8. Kumar,A.,Singh,M. & Molur,S.2008. *Macaca silenus*. The IUCN Red List of Threatened species 2008:e.T12559A3358033.
9. Kumara, H.N and M.Singh .2004. Distribution and abundance of primates in rain forests of the Western Ghats, Karnataka, India and the conservation of *Macaca silenus*. *International Journal of Primatology*. 25, 1001-1018.
10. Lawlor, T.1979. Encyclopedia of mammals. New York; McGraw- publishing company.

11. Molur .S, Brandon- Jones. D, Dittus, Eudey.A, Kumar.A, Singh.M, Feeroz.M.M, Chalise.M, Priya.P, and Walker .S (2003). Status of south Asian primates. Conservation assessment and management plan (CAMP) Workshop report 2003. Zoo outreach organization/CBSG- South Asia, Coimbatore.
12. Nelson, R.J 2010. Encyclopedia of Animal behavior.
13. Nowak, R.1999. Walker's mammals of the world, 6th edition. Boston and London, The Johns Hopkins university press.
14. Ramachandran, K.K, Joseph, Gigi K (2001). Distribution and demography of diurnal primates in silent valley national park and adjacent areas, Kerala, India. *Journal of the Bombay Natural History Society*.98 (2). 191-196.
15. Singh Mewa and Kaumanns Werner (2004) Distribution and abundance of primates in rain forests of the Western Ghats, Karnataka, India and the conservation of *Macaca silenus*. *International Journal of Primatology*. 25(5): abstract doi:10.1023/B: IJOP.00 000 43348.06255.7F.

